What is claimed is:

1. An optoelectronic device comprising:

a. a substrate;

b. at least one dielectric waveguide in the substrate; and

c. at least one semiconductor layer physically bonded to the substrate and optically coupled to the at least one dielectric waveguide in the substrate, the at least one active semiconductor layer being able to generate light, detect light, amplify light or otherwise modulate amplitude or phase of light.

2. The optoelectronic device of claim 1 wherein the at least one semiconductor layer has adjacent layers of P, I and N material.

3. The optoelectronic device of claim 2 wherein the N material layer is closer to the at least one dielectric waveguide in the substrate than is the P material layer.

4. The optoelectronic device of claim 1 wherein the at least one semiconductor layer is disk-shaped.

5. The optoelectronic device of claim 4 wherein the at least one dielectric waveguide in the substrate includes an inlet waveguide and an associated outlet waveguide.

6. The optoelectronic device of claim 5 wherein the outlet waveguide is arranged close to, but spaced from the inlet waveguide in the substrate and wherein the disk-shaped device is disposed over or immediately adjacent both the inlet waveguide in the substrate and the outlet waveguide in the substrate for controlling the coupling of light from the inlet dielectric waveguide into the outlet waveguide.

7. The optoelectronic device of claim 6 wherein the disk-shaped device is divided into two associated devices having a common I layer and a notched P layer, with one of the associated devices having a relatively larger P layer and the other one of the associated devices having a relatively smaller P layer.

8. The optoelectronic device of claim 7 wherein the other one of the associated devices having a relatively smaller P layer is disposed over or adjacent outlet waveguide disposed in said substrate.

9. The optoelectronic device of claim 6 wherein the disk-shaped device has P, I and N layers, the N layer being adjacent the substrate, and has an annular opening therein which exposes the N layer adjacent the substrate.

10. The optoelectronic device of claim 9 further including contacts formed by metalization layers disposed on the N layer in the annular opening and on the P layer.

11. The optoelectronic device of claim 1 wherein the at least one semiconductor layer comprises P, I and N layers, the N layer being disposed adjacent the substrate, the I layer being disposed on the N layer and the P layer being disposed on the I layer.

12. The optoelectronic device of claim 11 wherein the P and I layers have common widths in a cross section view taken perpendicular to the at least one waveguide and the N layer is wider than said P and I layers in said cross section view taken perpendicular to the at least one waveguide.

13. The optoelectronic device of claim 12 wherein the P and N layers in said cross section view taken perpendicular to the at least one waveguide are essentially centered on said at least one waveguide.

14. The optoelectronic device of claim 11 further including contacts formed by metalization layers disposed on the N layer and on the P layer.

15. The optoelectronic device of claim 11 wherein said N layer includes at least one tapered structure formed of N layer material, at least one tapered structure extending in a direction parallel to said at least one waveguide, the at least one tapered structure also being essentially centered on said at least one waveguide in the cross section view taken perpendicular to the at least one waveguide.

16. The optoelectronic device of claim 1 further comprising a bonding interface layer between the at least one semiconductor layer and the substrate.

17. The optoelectronic device of claim 16 wherein the bonding interface layer comprises: BPSG, BSG, SiO_2, SiN or SOG or combinations thereof.

18. The optoelectronic device of claim 16 wherein the bonding interface layer has a thickness and index of refraction adapted to facilitate optical coupling between said at least one semiconductor layer and said at least one waveguide.

19. The optoelectronic device of claim 16 wherein the bonding interface layer improves adhesion between said at least one semiconductor layer and said at least one waveguide.

20. A method of making an optoelectronic device comprising:

a. providing a first substrate;

b. forming at least one dielectric waveguide in the first substrate;

c. providing a second substrate having layers or islands of semiconductor material grown thereon;

d. bonding an upper most layer of the second substrate onto an exposed surface of the first substrate; and

e. etching at least portions of the layers or islands of semiconductor material initially grown on the second substrate to define at least one active device, the at least one active device being physically bonded to the first substrate and optically coupled to the at least one dielectric waveguide in the first substrate.

21. The method of claim 20 further including removing the second substrate leaving, on the first substrate, the layers or islands of semiconductor material initially grown on the second substrate.

22. The method of claim 20 wherein the at least one dielectric waveguide is formed in the first substrate adjacent a first surface thereof and wherein in step d the exposed surface is said first surface.

23. The method of claim 20 wherein the optoelectronic device wherein the layers or islands of semiconductor material have adjacent layers of P, I and N material, with the N material layer being closer to the at least one dielectric waveguide in the substrate than is the P material layer.

24. The method of claim 20 wherein the at least one dielectric waveguide is formed in the first substrate adjacent a first surface thereof and further comprising depositing a bonding interface layer onto at least one of the upper most layers of the second substrate and the first surface of the first substrate.

25. The method of claim 24 wherein the bonding interface layer comprises: BPSG, BSG, SiO_2, SiN or SOG or combinations thereof.

26. The method of claim 24 wherein the bonding interface layer has a thickness and index of refraction adapted to facilitate optical coupling between the at least one active device and said at least one waveguide.

27. The method of claim 24 wherein the bonding interface layer improves adhesion between the at least one active device and said at least one waveguide.

28. The method of claim 20 wherein step d comprises pressing the upper most layer of the second substrate onto the exposed surface of the first substrate to form a bond therebetween and annealing the first and second substrates to a temperature sufficient to strengthen the bond.

29. The method of claim 20 wherein step e includes etching the layers or islands of semiconductor material initially grown on the second substrate to define a plurality of different active devices.

30. The method of claim 20 wherein step c includes providing a plurality of second substrates each having layers or islands of semiconductor material grown thereon; wherein step d includes bonding an upper most layer of the plurality second substrates onto the exposed surface of the first substrate; and wherein step e includes etching the layers or islands of semiconductor material initially grown on the plurality of second substrates to define a plurality of different active devices.

31. The method of claim 20 wherein step e includes etching the layers or islands of semiconductor material initially grown on the second substrate to define a plurality of different active devices having different physical shapes.

32. The method of claim 31 wherein the layers or islands of semiconductor material

initially grown on the second substrate comprises P, I and N layers, the N layer being disposed adjacent the substrate in step d, the I layer being disposed on the N layer and the P layer being disposed on the I layer.

33. The method of claim 32 wherein the P and I layers of at least one active device being etched to have a common width in a cross section view taken perpendicular to the at least one waveguide and the N layer of said at least one active device being etched to be wider than said P and I layers of said at least one active device in at least one cross section view taken perpendicular to the at least one waveguide.

34. The method of claim 33 wherein step e includes etching at least one elongated tapered element from the N layer, the at least one elongated tapered element having a major axis which is centered on a longitudinal axis of the at least one waveguide.

35. The method of claim 31 wherein the P, I and N layers of at least one active device being etched to have a common outside diameter and the P and I layers of said at least one active device being etched to define an annulus therein.

36. The method of claim 35 wherein further including forming a metal contact layer on an exposed annular portion of the P layer and forming another metal contact in contact with the N layer in said annulus.

37. The method of claim 36 wherein the at least one active device is disk shaped and at least two dielectric waveguides are formed in the first substrate, the at least one active device being disposed over the at least two waveguides.

38. The method of claim 37 wherein the disk shaped active device has a centerline and wherein waveguides each have centers and wherein the centers of the at least two dielectric

waveguides are equally spaced from the centerline of the disk shaped active device.

39. The method of claim 37 wherein the disk-shaped device is divided into two associated devices by etching notches in at least the P layer, with one of the associated devices having a relatively larger sized P layer and the other one of the associated devices having a relatively smaller sized P layer.

40. The method of claim 20 wherein the semiconductor material is selected from those semiconductor material capable of generating light, detecting light, amplifying light or otherwise modulating the amplitude or phase of light.

41 The method of claim 20 further including forming an outlet waveguide in the first substrate.

42. The method of claim 41 wherein the outlet waveguide is disposed close to, but spaced from the at least one dielectric waveguide in the substrate and wherein a disk-shaped device is disposed over or immediately adjacent both the at least one dielectric waveguide in the substrate and the outlet waveguide for controlling the coupling of light from the at least one dielectric waveguide and into the outlet waveguide.

43. The method of claim 42 wherein the disk-shaped device is divided into two associated devices by etching notches in at least the P layer, with one of the associated devices having a relatively larger sized P layer and the other one of the associated devices having a relatively smaller sized P layer.

44. The method of claim 43 wherein the other one of the associated devices having the relatively smaller sized P layer is disposed over or adjacent the outlet waveguide disposed in said substrate.